

## **REMARKS**

Claims 7 to 12 are currently pending in the present application. In the final Office Action mailed on August 30, 2006, claims 7-11 have been rejected under 35 U.S.C. § 103(a), and claims 7-11 have been rejected under the judicially created doctrine of obviousness-type double patenting. By the present amendment, claim 7 has been amended, and new claim 12 has been added. No new matter has been added by these amendments, as support thereof can be found in the present specification at, *inter alia*, page 3, lines 16-18. Applicants respectfully submit that the pending claims are now in condition for allowance.

### **I. Rejection of Claims 7 to 11 Under 35 U.S.C. §103(a)**

Claims 7 to 11 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over United States Patent No. 4,649,023 ("Sabol") in view of United States Patent No. 5,832,050 ("Rebeyrolle"). It is respectfully submitted that these rejections should be withdrawn for at least the following reasons.

In rejecting a claim under 35 U.S.C. § 103(a), the Examiner bears the initial burden of presenting a prima facie case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, 28 U.S.P.Q.2d 1955, 1956 (Fed. Cir. 1993). To establish prima facie obviousness, three criteria must be satisfied. First, there must be some suggestion or motivation to modify or combine reference teachings. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596 (Fed. Cir. 1988). This teaching or suggestion to make the claimed combination must be found in the prior art and not based on the application disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991). Second, there must be a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 U.S.P.Q. 375 (Fed. Cir. 1986). Third, the prior art reference(s) must teach or suggest all of the claim limitations. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Applicants respectfully submit that a prima facie case of obviousness has not been established in regard to the pending claims.

Sabol is directed to a process for fabricating a zirconium-niobium alloy and articles resulting therefrom. According to Sabol, "[a]rticles, such as tubing, which have excellent corrosion resistance to steam at elevated temperatures and to hydriding, are produced from zirconium alloys containing 0.5 to 2.0 percent niobium,

up to 1.5 percent tin, and up to 0.25 percent of a *third alloying element* such as iron, chromium, molybdenum, vanadium, copper, nickel and tungsten.” Sabol, abstract (emphasis added).

Rebeyrolle is directed to a zirconium-based alloy, manufacturing process, and use in a nuclear reactor. Rebeyrolle discloses that “[t]he alloy has a base composition similar to that of a zirconium alloy of known type used for the manufacture of an element intended for use in the core of a nuclear reactor, such as a cladding tube, a guide tube, or another structural element of a fuel assembly. In addition, the alloy contains sulphur in a proportion by weight of between 8 and 100 ppm and preferably between 8 and 30 ppm.” Rebeyrolle, abstract.

In contrast to the teachings of Sabol and Rebeyrolle, the method of the present invention, as currently recited in independent claim 7, includes “a zirconium based alloy which also contains, 0.03 to 0.25% in total firstly of iron, [and] secondly, at least one of the elements selected from the group consisting of chromium and vanadium....” Claims 8-11, and new claim 12, depend from claim 7 and thus include this claim limitation as well.

Although the Office Action asserts that “Sabol treats Fe, Cr and V as equivalents” (Office Action mailed August 30, 2006, page 5, section 5), Applicants respectfully disagree. Nowhere in Sabol is it suggested that there could be a significant presence of several of the seven alloying elements cited therein (iron, chromium, molybdenum, vanadium, copper, nickel and tungsten) as the third element of the composition. In fact, iron is used throughout the examples as the third alloying element (see Sabol, Tables I-III), and Sabol repeatedly refers to “a” or “the” third alloying element, not to several third alloying elements (see, e.g., Sabol, col. 2, lines 11, 50, 59, 66). To that end, we also note the composition listed in Table IV of Sabol wherein 0.1% of Fe is present in the alloy, yet Cr, Cu, Ni and W are specified as being present only at an impurity level, and V and Mo are not even present. That is, the joint presence of more than one of these elements in the alloy is not taught nor suggested by this composition. Thus, Sabol does not disclose the equivalency of Fe, Cr and V as asserted in the Office Action.

Furthermore, Applicants point out that Sabol’s disclosure of requirements on the precipitates of the alloy (particularly on their size) is further evidence that the

above-referenced seven alloying elements (iron, chromium, molybdenum, vanadium, copper, nickel and tungsten) are not taught to be equivalents in Sabol. That is, if several of the seven alloying elements were significantly present in the alloy, they would also have an influence on the composition, morphology and size of the resulting precipitates. Thus, there is no reason to believe that an alloy having such an influenced composition, morphology and precipitate size would necessarily have properties compatible with the requirements of Sabol (such as, deformability, corrosion resistance, hydration resistance, etc.). In addition, one would not know whether the specified temperatures for the thermal treatments disclosed in Sabol would still be relevant for giving the required properties to the products disclosed in Sabol. To that end, Applicants submit herewith (via a separate Information Disclosure Statement) two documents which show that all of the seven alloying elements as disclosed in Sabol do not have the same effects on the alloy.

The Kim *et al.* article (entitled *Influence of thermomechanical treatment on the corrosion behavior of Zr-1Nb-0.2Cu alloys*) shows that the influence of Cu in Zr-Nb alloys is not the same as the influence of Fe. Whereas Fe forms  $Zr(Nb, Fe)_2$  precipitates, Cu forms  $Zr_2Cu$  precipitates. As also shown in the Kim *et al.* article, for an alloy with 0.24% Cu (see table 1), the precipitates contain Cu and Nb (see figs. 8 and 9).

In addition, the Nikulin *et al.* article (entitled *Effects of Microstructure on Ductility and Fracture Resistance of Zr-1.2Sn-1Nb-0.4Fe Alloy*) deals with E635 alloys having 0.20, 0.35 and 0.46% Fe (see p. 697). In Table 1 of the Nikulin *et al.* article, different types of precipitates with different sizes are shown according to the different thermal treatments ( $\beta Nb$ ,  $Zr_3Fe$ ,  $Zr(NbFe)_2$ ). See also, the Nikulin *et al.* article, p. 696 (last paragraph); p. 698 (last paragraph).

As can be seen in reviewing and comparing the Kim *et al.* article and the Nikulin *et al.* article, not only the composition, but also the crystallographic nature and the size of the precipitates vary according to the nature of the third alloying element. Consequently, the above-referenced seven alloying elements cited in Sabol cannot be partially or totally substituted with one another without significant changes on the resulting alloy properties. Therefore, it is also respectfully submitted that a *prima facie* case of obviousness has not been established by the cited patents because the modification of the method and composition of the primary reference of

Sabol by significantly including more than one of the seven alloying elements in the alloy would result in the composition, the crystallographic nature and the size of the resulting precipitates varying according to the nature of the third alloying element. See *In re Ratti*, 270 F.2d 810, 813 (C.C.P.A. 1959) (court reversed rejection of claims holding that the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principles under which the [primary reference's] construction was designed to operate").

In addition, although the Office Action asserts that the two temperature ranges of Sabol and that of the present claims "overlap at 1000°C" (Office Action mailed August 30, 2006, page 5, section 6), Applicants respectfully disagree. While Sabol discloses "heating the alloy to about 950°-1000°C" (Sabol, col. 3, lines 11-12), pending claim 7 recites "heating to between 1000°C and 1200°C." Thus, there is no "overlap at 1000°C" as the present claim language of "between" does not include the end-point value of 1000°C. Also, in industrial practice it is rather difficult to define and regulate the temperature in a furnace within a precision of  $\pm 1^\circ\text{C}$ . Thus, when Sabol discloses "about 950°-1000°C," a person skilled in the art understands this range to be  $975^\circ \pm 25^\circ\text{C}$ , and when the present inventors say "between 1000°-1200°C," the person skilled in the art understands this range to be  $1100^\circ\text{C} \pm 99^\circ\text{C}$ . Thus, these two heat treatments take place normally in two distinct thermal ranges, which is shown by the recited ranges.

Applicants respectfully submit that the pending claims are not rendered obvious by Sabol or Rebeyrolle, alone or in combination. There is no teaching, motivation nor suggestion in Sabol or Rebeyrolle, to "pick and choose" from the numerous materials, elements and temperatures as possible parameters for an alloy and a method of manufacturing a tube employing that alloy, and to modify its teaching in order to arrive at the presently claimed invention, and the Examiner has pointed to no such teaching, motivation or suggestion. See *Ex parte Chicago Rawhide Mfg. Co.*, 223 U.S.P.Q. 351, 353 (Bd. Pat. App. & Inter. 1984) ("The mere fact that a worker in the art could rearrange the parts of the reference device to meet the terms of the claims on appeal is not by itself sufficient to support a finding of obviousness. The prior art must provide a motivation or reason for the worker in the art, without the benefit of appellant's specification, to make the necessary changes in

the reference device.”). Applicants respectfully point out that the present invention is based on a combination of features concerning alloy composition on the one hand, and thermal treatment parameters on the other hand. In that regard, the two distinct thermal ranges of the present invention and Sabol (as discussed above), are evidence of the non-obviousness of the present invention as they show that: (1) the functions of these treatments are generally different; and (2) these treatments are used on materials which, most generally, have different compositions. For example, in addition to the differences in regard to the third alloying element of Sabol as discussed above, the very low presence of tin (< 2000ppm) in the alloy of the present invention stands in stark contrast to the teaching of Sabol, wherein tin can be present in an amount up to 1.5%, with a preferred range of 0.9-1.1%. As can be seen in Table III of the present specification, this low level of tin in accordance with the present invention considerably reduces corrosion in an aqueous medium with the levels of lithium content currently used to run reactors.

In regard to new claim 12, Applicants respectfully submit that this new claim is further distinguished from Sabol and/or Rebeyrolle for at least the following reasons. Once again, Applicants respectfully point out that the present invention is based on a combination of features concerning alloy composition on the one hand, and thermal treatment parameters on the other hand. In accordance with new claim 12, the final heat treatment at between 560°C and 620°C “brings the tube to a recrystallized state.” This embodiment of the method of the invention stands in sharp contrast to the examples provided in Sabol which include a stress-relieving annealing at the relatively low temperature of 480°C. See Sabol, col. 4, lines 4-5 and 12; and col. 5, lines 15-16. Thus, this additional claim limitation recited in claim 12 further differentiates the method of the present invention from Sabol. It also serves to add to the numerous materials, elements and temperatures which are possible parameters for an alloy and a method of manufacturing a tube employing that alloy, making it even less likely that one would “pick and choose” from these numerous items and modify such teachings in order to arrive at the presently claimed invention of claim 12.

Therefore, for at least the preceding reasons, Applicants respectfully submit that the pending claims are not rendered obvious by Sabol or Rebeyrolle, alone or in

combination. Thus, it is respectfully submitted that the rejection of the claims based on Sabol and Rebeyrolle should be withdrawn.

## **II. Rejection of Claims 7 to 11 Under Nonstatutory Obviousness-Type Double Patenting**

Claims 7 to 11 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting over claims 13 to 16 of copending application 10/885,927. This obviousness-type double patenting rejection has been noted by the Applicants. If these provisional double patenting rejections are the only remaining rejections upon entry of the present amendment, then in accordance with M.P.E.P § 804 I.B.1., Applicants would request withdrawing these provisional rejections.

Claims 7 to 11 also stand rejected on the ground of nonstatutory obviousness-type double patenting over claim 9 of United States Patent No. 6,863,475. Claim 9 of United States Patent No. 6,863,475 is directed to an apparatus for injecting fluids, and it in no way renders obvious the method claims of the present invention. Thus, it is respectfully submitted that this obviousness-type double patenting rejection should be withdrawn.

## **III. Interview Summary**

Applicants thank Examiner Sheehan for the courtesy extended during a phone conversation with John Vereb on November 21, 2006. During the interview, the following was discussed:

- (A) No exhibit or demonstration was shown.
- (B) All claims were discussed, particularly independent claim 7.
- (C) Sabol and Rebeyrolle were discussed.
- (D) The possibility of amending independent claim 7 to include Markush group language was discussed.
- (E) Applicants argued that the recited additional alloying elements and temperature limitations of the pending claims were not taught by the cited art.

(F) It is not believed that other pertinent issues were discussed.

(G) Applicants indicated that a Response to the Office Action mailed on August 30, 2006 would likely be filed wherein a summary of the arguments discussed during the interview would be included.


(H) There was no e-mail communication.

#### IV. Conclusion

It is therefore respectfully submitted that the pending claims are allowable. All issues raised by the Examiner have been addressed, and an early and favorable action on the merits is solicited.

Respectfully submitted,  
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